

Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Improved Nonambipolar Electron Source Operation with Permanent Magnets¹ JESSE GUDMUNDSON, NOAH HERSHKOWITZ, University of Wisconsin-Madison — The Nonambipolar Electron Source (NES) is a Radio Frequency (rf) plasma-based electron source that does not rely on electron emission at a cathode surface. All electrons are extracted at an electron sheath through a biased ring and all ions are lost radially to a biased Faraday shield. An electromagnet in the original NES has been replaced by a NdFeB permanent magnet array. A portion of the magnet array consists of a ring of radially aligned magnets followed by a ring of axially aligned magnets that produce a peak field of approximately 800 Gauss. Axial magnetic field strength at the extraction ring was increased using an additional ring of axially aligned magnets. Measurement of the magnetic field was in good agreement with field predicted by the FEMM (Finite Element Method Magnetics) code. Optimization of the single turn antenna and biased ring position in the magnetic field will be discussed. At least 15 A of electron current was extracted using a flow rate of 15 sccm Ar at 600 W of rf power at 13.56 MHz. For comparison, the original NES required 1200 W of power to achieve 15 A of extracted current. Compared to the previous coil design, the NdFeB magnets are lighter weight and require no power.

¹work funded by DOE grant No. DE-FG02-97ER54437

Jesse Gudmundson
University of Wisconsin-Madison

Date submitted: 18 Jul 2008

Electronic form version 1.4